UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P O Box 1450
Alexandria, Virginia 22313-1450
www uspto gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/537,514	11/16/2006	Kyongtae T. Bae	43880-45121	4651

21888 7590 07/22/2010
THOMPSON COBURN LLP
ONE US BANK PLAZA
SUITE 3500
ST LOUIS, MO 63101

EXAMINER	
TUCKER, WESLEY J	

ART UNIT	PAPER NUMBER
2624	

NOTIFICATION DATE	DELIVERY MODE
07/22/2010	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

IPDOCKET@THOMPSONCOBURN.COM

Office Action Summary	Application No.	Applicant(s)	
	10/537,514	BAE ET AL.	
	Examiner	**Art Unit**	
	Wes Tucker	2624	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE _3_ MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on _03 June 2005_.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) _1-68_ is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) _1-25,27-29,32-45 and 47-68_ is/are rejected.

7)☒ Claim(s) _26,30,31 and 46_ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on _03 June 2005_ is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _10/17/05, 4/1/09, 7/31/09, 8/25/09_.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 101

35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

Claims 51 and 60 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter. Claims 51 and 60 recite computer readable mediums. USPTO policy requires such claims to now recite "non-transitory computer readable medium." Appropriate correction is required.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1-9, 11-25, 27-29, 32-45, 47-65 and 67-68 are rejected under 35 U.S.C. 102(e) as being anticipated by US Patent Application Publication 2003/0095696 to Reeves et al.

With regard to claim 1, Reeves discloses ***a method for automated detection of target structures shown in digital medical images, the method of comprising:***

generating a three dimensional (3D) volumetric data set of a patient region within which the target structure resides from a plurality of segmented medical image slices (paragraph [0026], Reeves discloses 3D CT scan slices for detecting nodules in lung images)***;***

grouping contiguous structures that are depicted in the 3D volumetric data set to create corresponding grouped structure data sets (paragraphs [0013], [0014], [0020] and [0021], Reeves discloses determining and segmenting lunch regions in the images)***;***

assigning each grouped structure data set to one of a plurality of detection algorithms, each detection algorithm being configured to detect a different type of target structure (paragraphs [0021] and [0144], [0150]-[0154], Reeves teaches that each region has different segmentation techniques. For example, Reeves teaches that different templates are used to detect nodules according tot eh location of the nodule such as if the nodule is isolated or if the nodule is adjacent to a lung wall or other structure)***; and***

processing each grouped structure data set according to its assigned detection algorithm to thereby detect whether any target structures are present in the medical images (paragraphs [0015]-[0018], Reeves teaches identifying and characterizing found nodule structures).

With regard to claim 2, Reeves discloses ***the method of claim 1 wherein the patient region being imaged is a region that includes a plurality of vessels, further comprising:***

classifying each grouped structure data set as either a vessel group data set or a non-vessel group data set (paragraphs [0117] and [0121], Reeves disclose that vessels are thresholded and separated)***; and***

wherein the assigning step comprises assigning each vessel group data set to a first detection algorithm and assigning each non-vessel group data set to a second detection algorithm (paragraphs [0021] and [0144], [0150]-[0154], Reeves teaches that each region has different segmentation techniques. For example, Reeves teaches that different templates are used to detect nodules according to the location of the nodule such as if the nodule is isolated or if the nodule is adjacent to a lung wall or other structure such as vessels or rib cage. Therefore vessel regions and non-vessel regions use different detection algorithms or template functions).

With regard to claim 3, Reeves discloses ***the method of claim 2 wherein the processing step comprises:***

for each non-vessel group data set, determining a target structure status for the structure depicted therein based on geometric criteria(paragraphs [0117] and [0121], Reeves disclose that vessels are thresholded and separated and nodules are then determined)***; and***

for each vessel group data set, (i) convolving the vessel group data set with at least one predetermined 3D morphological filter to thereby compute a correlation value between the vessel group data set and the 3D morphological filter (paragraph [0153], Reeves discloses the template locator to be a 3D morphological filter)***,***

(ii) selecting a vessel group data set or subset thereof if its correlation value is within a predetermined range (paragraphs [0153]-[0155] and [0161], Reeves discloses a spherical template filter that has an adjustable radius or diameter for locating different sized nodules. There are limits to what is and is not considered a nodule)***, and***

(iii) determining a target structure status for the structure depicted in the selected data set based on geometric criteria (paragraphs [0153]-[0155] and [0161], Reeves discloses a spherical template filter that has an adjustable radius or diameter for locating different sized nodules. There are limits to what is and is not considered a nodule. The geometric criteria in this case is a spherical shape).

With regard to claim 4, Reeves discloses ***the method of claim 2 wherein the target structure is a pulmonary nodule, wherein the medical images are computed tomography (CT) images, and wherein the patient region depicted in the CT images is the patient's lung region*** (paragraph [0026], Reeves discloses 3D CT scan slices for detecting nodules in lung images).

With regard to claim 5, Reeves discloses ***the method of claim 4 wherein the geometric criteria includes at least one of the group consisting of structure size, structure compactness, and structure elongation*** (paragraphs [0144]-[0147], Reeves discloses a template locator to locate nodules according to size and shape).

With regard to claim 6, Reeves discloses ***the method of claim 4 wherein the convolving step comprises convolving the vessel group data set with a plurality of predetermined 3D morphological filters to thereby compute correlation values between the vessel group data set and the 3D morphological filters*** (paragraph [0153], Reeves discloses the template locator to be a 3D morphological filter).

With regard to claim 7, Reeves discloses ***the method of claim 6 wherein the predetermined morphological filters comprise a plurality of spherical filters, each spherical filter being tuned to a different predetermined diameter*** (paragraphs [0153]-[0155], Reeves discloses a spherical template filter that has an adjustable radius or diameter for locating different sized nodules).

With regard to claim 8, Reeves discloses ***the method of claim 4 further comprising segmenting the regions depicted the CT images to identify the patient's thorax and lung region, including any isolated nodules, perivascular nodules, and pleural nodules that may be present therein*** (paragraph [0021]).

With regard to claim 9, Reeves discloses ***the method of claim 4 wherein the target structure status determining steps comprise eliminating structures that are not pulmonary nodules and identifying structures not eliminated by the eliminating step as nodules*** (paragraph [0121]).

With regard to claim 11, Reeves discloses ***a device for detecting whether pulmonary nodules are present in a patient's lung region from a three-dimensional (3D) data set representative of a volumetric image of the patient's lung region, the device comprising:***

a processor configured to (1) identify contiguous structures in the 3D data set (paragraph [0026], Reeves discloses 3D CT scan slices for detecting nodules in lung images)***,***

(2) classify the identified contiguous structures according to a plurality of classifications, the classifications comprising a vessel contiguous structure classification and a non-vessel contiguous structure classification (paragraphs [0013], [0014], [0020] and [0021], Reeves discloses determining and segmenting several different lung regions in the images)***,***

(3) apply a first nodule detection operation to each vessel contiguous structure to determine a nodule status therefore, and

(4) apply a second nodule detection operation to each non-vessel contiguous structure to determine a nodule status therefor, wherein the first nodule detection operation is different than the second nodule detection

algorithm (paragraphs [0021] and [0144], [0150]-[0154], Reeves teaches that each region has different segmentation techniques. For example, Reeves teaches that different templates are used to detect nodules according to the location of the nodule such as if the nodule is isolated (non-vessel contiguous) or if the nodule is adjacent to a lung wall or other structure or vessel (vessel contiguous)).

With regard to claim 12, Reeves discloses ***the device of claim 11 wherein the processor is further configured to apply the first nodule detection operation by:***

segmenting nodule candidate structures from surrounding vessel structures through a correlation of each vessel contiguous structure with a 3D morphological filter filters (paragraph [0153], Reeves discloses the template locator to be a 3D morphological filter).***; and***

determining a nodule status for each segmented nodule candidate (paragraph [0144], Reeves uses the template to determine nodules according to size and location).

With regard to claim 13, Reeves discloses ***the device of claim 12 wherein the processor is further configured to perform the correlation by convolving each vessel contiguous structure with a 3D morphological filter*** (paragraph [0153], Reeves discloses the template locator to be a 3D morphological filter).

With regard to claim 14, Reeves discloses ***the device of claim 13 wherein the processor is further configured to perform the correlation by convolving each vessel contiguous structure with a plurality of 3D morphological filters*** (paragraph [0153], Reeves discloses the template locator to be one of several different types of 3D morphological filter).

With regard to claim 15, Reeves discloses ***the device of claim 14 wherein the filters comprise a plurality of spherical filters, each filter being tuned with a different diameter*** (paragraphs [0153]-[0155], Reeves discloses a spherical template filter that has an adjustable radius or diameter for locating different sized nodules).

With regard to claim 16, Reeves discloses ***the device of claim 14 wherein the processor is further configured to determine nodule status for the segmented nodule candidates by determining a nodule status for each nodule candidate at least partially on the basis of geometric criteria*** (paragraphs [0153]-[0155], Reeves discloses a spherical template filter that has an adjustable radius or diameter for locating different sized nodules according to shape and size).

With regard to claim 17, Reeves discloses ***the device of claim 16 wherein the geometric criteria includes size*** (paragraphs [0153]-[0155], Reeves discloses a

spherical template filter that has an adjustable radius or diameter for locating different sized nodules).

With regard to claim 18, Reeves discloses ***the device of claim 16 wherein the geometric criteria includes compactness*** (paragraphs [0153]-[0155], Reeves discloses a spherical template filter that has an adjustable radius or diameter for locating different sized nodules. Compactness is interpreted as a measure of size when it comes to image data).

With regard to claim 19, Reeves discloses ***the device of claim 16 wherein the geometric criteria includes elongation*** (paragraphs [0153]-[0155], Reeves discloses a spherical template filter that has an adjustable radius or diameter for locating different sized nodules of different shape. Elongation is interpreted to be related to shape).

With regard to claim 20, Reeves discloses ***the device of claim 16 wherein the geometric criteria includes size, compactness, and elongation*** (see discussion of claims 17, 18 and 19).

With regard to claim 21, Reeves discloses ***the device of claim 14 wherein the processor is further configured to perform the segmentation by determining that a nodule candidate exists if the correlation results in a correlation within a predetermined range of correlation values*** (paragraphs [0153]-[0155] and [0161], Reeves discloses a spherical template filter that has an adjustable radius or diameter for locating different sized nodules. There are limits to what is and is not considered a nodule).

With regard to claim 22, Reeves discloses ***the device of claim 12 wherein each non-vessel contiguous structure comprises a nodule candidate, and wherein the processor is further configured to apply the second nodule detection operation by determining a nodule status for each non-vessel nodule candidate at least partially on the basis of geometric criteria*** (paragraphs [0021] and [0144], [0150]-[0154], Reeves teaches that each region has different segmentation techniques. For example, Reeves teaches that different templates are used to detect nodules according to the location of the nodule such as if the nodule is isolated or if the nodule is adjacent to a lung wall or other structure such as vessels or rib cage. Therefore vessel regions and non-vessel regions use different detection algorithms or template functions).

With regard to claim 23, Reeves discloses ***the device of claim 22 wherein the processor is further configured to determine the nodule status for each non-***

vessel nodule candidate by comparing each nodule candidate with a size criteria (paragraph [0161], Reeves discloses that there are limits on the size of what is considered a nodule).

With regard to claim 24, Reeves discloses ***the device of claim 23 wherein the size criteria is diameter*** (paragraph [0144], see radius).

With regard to claim 25, Reeves discloses ***the device of claim 22 wherein the processor is further configured to determine the nodule status for each non-vessel nodule candidate by comparing each nodule candidate with a compactness criteria*** (paragraphs [0153]-[0155], Reeves discloses a spherical template filter that has an adjustable radius or diameter for locating different sized nodules. Compactness is interpreted as a measure of size when it comes to image data).

With regard to claim 27, Reeves discloses ***the device of claim 22 wherein the processor is further configured to determine the nodule status for each non-vessel nodule candidate by comparing each nodule candidate with an elongation criteria*** (paragraphs [0153]-[0155], Reeves discloses a spherical template filter that has

an adjustable radius or diameter for locating different sized nodules of different shape. Elongation is interpreted to be related to shape).

With regard to claim 28, Reeves discloses ***the device of claim 27 wherein the processor is further configured to compare each non-vessel nodule candidate with an elongation criteria by comparing each non-vessel nodule candidate with a two-dimensional (2D) elongation criteria and a 3D elongation criteria*** (paragraphs [0153]-[0155], Reeves discloses a spherical template filter that has an adjustable radius or diameter for locating different sized nodules of different shape. Elongation is interpreted to be related to shape. Reeves also discloses the template in 3D).

With regard to claim 29, Reeves discloses ***the device of claim 28 wherein the processor is further configured to compare each non-vessel nodule candidate with an elongation criteria by comparing a non-vessel nodule candidate with the 3D elongation criteria only if that non-vessel nodule candidate satisfies the 2D elongation criteria*** (paragraphs [0153]-[0155], Reeves discloses a spherical template filter that has an adjustable radius or diameter for locating different sized nodules of different shape. Elongation is interpreted to be related to shape. Reeves also discloses the template in 3D).

With regard to claim 32, see claim 20.

With regard to claim 33, Reeves discloses ***the device of claim 11 wherein the processor is further configured to generate the 3D data set from a plurality of 2D image slices of the patient's lung region*** (paragraph [0026]).

With regard to claim 34, Reeves discloses ***the device of claim 33 wherein the 2D image slices comprise a plurality of computed tomography slices*** (paragraph [0026]).

With regard to claim 35, Reeves discloses ***the device of claim 33 wherein the 2D image slices comprise a plurality of magnetic resonance slices*** (paragraph [0009]).

With regard to claim 36, Reeves discloses ***the device of claim 33 wherein the 2D image slices comprise a plurality of ultrasound slices*** (paragraph [0009]).

With regard to claim 37, Reeves discloses ***a device for analyzing a 3D data set representative of a patient's lung region, the device comprising:***

a processor configured to (1) group the data set into data subsets, each subset being representative of a contiguous structure (paragraphs [0013], [0014], [0020] and [0021], Reeves discloses determining and segmenting lung regions in the images)***;***

(2) identify each data subset that corresponds to a vessel (paragraph [0021] and Fig. 12, Reeves teaches identifying subsets of the lungs where vessels occur)***, and***

(3) segment any perivascular nodule candidates from each identified subset by correlating that identified subset with at least one 3D morphological filter that is tuned to an expected shape of a perivascular nodule (paragraphs [0021] and [0144], [0150]-[0154], Reeves teaches that each region has different segmentation techniques. For example, Reeves teaches that different templates are used to detect nodules according to the location of the nodule such as if the nodule is isolated or if the nodule is adjacent to a lung wall or other structure. The filter or template is tuned to the spherical shape of nodules).

With regard to claim 38, Reeves discloses ***the device of claim 37 wherein the processor is configured to perform the correlation by correlating each identified subset with a plurality of 3D morphological filters, each filter being tuned to a different expected shape of a perivascular nodule*** (paragraphs [0021] and [0144], [0150]-[0154], Reeves teaches that each region has different segmentation techniques. For example, Reeves teaches that different templates are used to detect nodules

according to the location of the nodule such as if the nodule is isolated or if the nodule is adjacent to a lung wall or other structure. The filter or template is tuned to the spherical shape of nodules).

With regard to claim 39, Reeves discloses ***the device of claim 38 wherein at least one filter is a spherical filter tuned with a predetermined diameter*** (paragraphs [0153]-[0155]).

With regard to claim 40, Reeves discloses ***the device of claim 39 wherein the predetermined diameter is approximately 3 mm*** (paragraphs [0026] and [0108]).

With regard to claim 41, Reeves discloses ***the device of claim 38 wherein a plurality of the filters are spherical filters, each spherical filter being tuned with a different predetermined diameter*** (paragraphs [1053]-[0155], reeves discloses filters with adjustable radii).

With regard to claim 42, Reeves discloses ***the device of claim 38 wherein the processor is further configured to perform the correlation by performing the***

correlations in parallel, each parallel correlation being configured to correlate an identified subset with one of the filters (paragraph [0021]).

With regard to claim 43, Reeves discloses ***the device of claim 37 wherein the processor is further configured to perform the correlation by convolving each identified subset with the at least one filter to thereby compute a correlation value*** (paragraph [0153], Reeves discloses the template locator to be a 3D morphological filter convolved with potential nodules).

With regard to claim 44, Reeves discloses ***the device of claim 43 wherein the processor is further configured to perform the segmentation by determining whether a perivascular nodule candidate exists at least partially according to the computed correlation value*** (paragraphs [0153]-[0155] and [0161], Reeves discloses a spherical template filter that has an adjustable radius or diameter for locating different sized nodules. There are limits to what is and is not considered a nodule).

With regard to claim 45, Reeves discloses ***the device of claim 44 wherein the processor is further configured to determine whether a perivascular nodule candidate exists by determining that a perivascular nodule candidate does exist if the computed correlation value lies within a predetermined range of correlation***

values (paragraphs [0153]-[0155] and [0161], Reeves discloses a spherical template filter that has an adjustable radius or diameter for locating different sized nodules. There are limits to what is and is not considered a nodule).

With regard to claim 47, Reeves discloses ***the device of claim 38 wherein the processor is further configured to, for each segmented perivascular nodule candidate, determine a nodule status therefor at least partially on the basis of geometric criteria*** (paragraphs [0153]-[0155], Reeves discloses spherical templates to determine nodule status).

With regard to claim 48, Reeves discloses ***the device of claim 47 wherein the geometric criteria comprises at least one selected from the group consisting of candidate size, candidate compactness, and candidate elongation*** (paragraphs [0153]-[0155], Reeves discloses spherical templates of a certain size to determine nodule status. Compactness and elongation are interpreted as shape and size measurements).

With regard to claim 49, Reeves discloses ***the device of claim 37 wherein the processor is further configured to generate the 3D data set from one selected from the group consisting of a plurality of computed tomography (CT) slices, a***

plurality of magnetic resonance (MR) slices, and a plurality of ultrasound slices (paragraph [0009]).

With regard to claim 50, Reeves discloses ***the device of claim 37 wherein the processor is further configured to (1) identify each data subset that corresponds to a non-vessel, and (2) for each subset identified as corresponding to a non-vessel, determine a nodule status therefor at least partially on the basis of geometric criteria*** (paragraphs [0021] and [0144], [0150]-[0154], Reeves teaches that each region has different segmentation techniques. For example, Reeves teaches that different templates are used to detect nodules according to the location of the nodule such as if the nodule is isolated or if the nodule is adjacent to a lung wall or other structure. The filter or template is tuned to the spherical shape of nodules).

With regard to claim 51, the discussion of claim 11 applies. Reeves disclose a computer readable medium storing a program to perform the steps performed by the processor discussed in claim 11 (paragraph [0101]).

With regard to claims 52-55, the discussions of claims 12, 13 and 16 apply respectively.

With regard to claim 56, Reeves discloses ***a device configured to automatically detect the presence of pulmonary nodules depicted within a three-dimensional data set representative of a patient's lung region, the data set comprising a plurality of contiguous structures associated with a first classification and a plurality of contiguous structures associated with a second classification*** (paragraphs [0010]-[0019])***, the device comprising***:

a processor configured to (1) apply a first nodule detection algorithm to contiguous structures associated with the first classification, and

(2) apply a second nodule detection algorithm to contiguous structures associated with the second classification (paragraphs [0021] and [0144], [0150]-[0154], Reeves teaches that each region has different segmentation techniques. For example, Reeves teaches that different templates are used to detect nodules according to the location of the nodule such as if the nodule is isolated (non-vessel contiguous) or if the nodule is adjacent to a lung wall or other structure or vessel (vessel contiguous)).

With regard to claim 57, Reeves discloses ***the device of claim 56 wherein the first classification comprises a vessel classification, and wherein the second classification comprises a non-vessel classification*** (paragraphs [0021] and [0144], [0150]-[0154], Reeves teaches that each region has different segmentation techniques. For example, Reeves teaches that different templates are used to detect nodules according to the location of the nodule such as if the nodule is isolated (non-vessel

contiguous) or if the nodule is adjacent to a lung wall or other structure or vessel (vessel contiguous)).

With regard to claim 58, Reeves discloses ***the device of claim 57 wherein the processor is further configured to apply the first nodule detection algorithm by segmenting perivascular nodule candidates from the vessel contiguous structures through a correlation of each vessel contiguous structure with a plurality of 3D morphological filters, each filter being tuned to an expected shape of a perivascular nodule*** (paragraphs [0153]-[0155], Reeves discloses spherical templates to determine nodule status).

With regard to claim 59, Reeves discloses ***a system for automatic detection of pulmonary nodules shown in CT images, the system comprising:***

a CT scanner for scanning a patient's lung region to generate a CT image data set (paragraph [0010])***; a computer configured to***

(1) segment CT image data corresponding to the patient's lung region from the CT image data set (paragraph [0021])***,***

(2) generate a three dimensional volumetric data set of a patient's lung region from the segmented CT image data (paragraphs [0010], [0011], and [0021]-[0026], Reeves discloses generating a set of CT image slices)***,***

(3) group contiguous structures that are depicted in the volumetric data set to create corresponding grouped structure data sets (paragraph [0021], Reeves discloses grouping the lung data into different sections)***,***

(4) classify each grouped structure data set as either a vessel group data set or a non-vessel group data set (paragraphs [0021] and [0144], [0150]-[0154], Reeves teaches that each region has different segmentation techniques. For example, Reeves teaches that different templates are used to detect nodules according to the location of the nodule such as if the nodule is isolated (non-vessel contiguous) or if the nodule is adjacent to a lung wall or other structure or vessel (vessel contiguous))***,***

(5) for each non-vessel group data set, determine a nodule status for the structure depicted therein based on geometric criteria paragraphs [0021] and [0144], [0150]-[0154], Reeves teaches that each region has different segmentation techniques. For example, Reeves teaches that different templates are used to detect nodules according to the location of the nodule such as if the nodule is isolated (non-vessel contiguous) or if the nodule is adjacent to a lung wall or other structure or vessel (vessel contiguous))***, and***

(6) for each vessel group data set,

(a) convolve the vessel group data set with a predetermined morphological filter to thereby compute a correlation value between the vessel group data set and the morphological filter (paragraph [0153], Reeves discloses the template locator to be a 3D morphological filter)***,***

(b) select a vessel group data set if its correlation value is within a predetermined range (paragraphs [0153]-[0155] and [0161], Reeves discloses a spherical template filter that has an adjustable radius or diameter for locating different sized nodules. There are limits to what is and is not considered a nodule).

(c) determine a nodule status for the structure depicted in the selected vessel group data set based on geometric criteria (paragraphs [0153]-[0155] and [0161], Reeves discloses a spherical template filter that has an adjustable radius or diameter for locating different sized nodules. There are limits to what is and is not considered a nodule. The geometric criteria in this case is a spherical shape).

With regard to claim 60, the discussion of claim 59 applies. Reeves discloses a computer program product for performing the elements of the system discussed in claim 59 (paragraph [0101]).

With regard to claim 61, Reeves discloses ***a method of analyzing a data set representative of a region of the patient's body, the method comprising:***

grouping contiguous structures depicted in the data set (paragraphs [0013]-[0014])***;***

identifying contiguous structures that correspond to a predefined classification (paragraph [0015])***; and***

segmenting target structure candidates from the identified structures by correlating each identified structure with at least one filter that is tuned to an expected shape of a target structure (paragraphs [0016]-[0018] and [0144] and [0151]-[0155], Reeves discloses segmenting lung image data, identifying structures in the image data and then using templates to determine possible nodules within the image data).

With regard to claim 62, Reeves discloses ***the method of claim 61 wherein the body region is the patient's lung region, wherein the predefined classification is a vessel classification, wherein the target structure candidates are perivascular nodule candidates, and wherein the at least one filter is a 3D morphological filter*** (paragraphs [0021] and [0144], [0150]-[0154], Reeves teaches that each region has different segmentation techniques. For example, Reeves teaches that different templates are used to detect nodules according to the location of the nodule such as if the nodule is isolated (non-vessel contiguous) or if the nodule is adjacent to a lung wall or other structure or vessel (vessel contiguous)).

With regard to claim 63, Reeves discloses ***the method of claim 62 wherein the lung region data set is a 3D data set*** (paragraphs [0153]-[0155]).

With regard to claim 64, Reeves discloses ***the method of claim 63 wherein the correlating step comprises correlating each identified vessel structure with a plurality of 3D morphological filters, each filter being tuned to a different expected shape of a perivascular nodule*** (paragraphs [0021] and [0144], [0150]-[0154], Reeves teaches that each region has different segmentation techniques. For example, Reeves teaches that different templates are used to detect nodules according to the location of the nodule such as if the nodule is isolated (non-vessel contiguous) or if the nodule is adjacent to a lung wall or other structure or vessel (vessel contiguous). These are interpreted as different shapes as well).

With regard to claim 65, Reeves discloses ***the method of claim 61 wherein the data set comprises a plurality of 2D image slices, and wherein at least one of the group consisting of the grouping step, the identifying step, and the segmenting step is performed on a 2D slice-by-slice basis*** (paragraphs [0026] and [0153]-[0155]).

With regard to claim 67, Reeves discloses ***the device of claim 34 wherein the processor is further configured to accommodate processing CT slices of different slice thicknesses*** (paragraph [0026]).

With regard to claim 68, Reeves discloses ***the device of claim 34 wherein the processor is further configured to accommodate processing CT slices of different reconstruction intervals*** (paragraph [0025]).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 10 and 66 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of US Patent Publication No. 2003/0095696 to Reeves et al and US Patent 6,470,092 to Li et al.

With regard to claims 10 and 66, Reeves discloses the respective methods of claim 1 and 61, but does not disclose that the target structures are colon polyps. Reeves is concerned with detecting nodules in lung images, but one of ordinary skill in the art would understand that the same techniques would be readily available to examine images of colon polyps as the two are very similar in both shape and dimension. Li for example teaches a similar nodule detection system and explains that his invention was studied and found applicable to CAD systems for detecting both nodules in chest radiographs as well as colon polyps. therefore it would have been

obvious to one of ordinary skill in the art at the time of invention to use the nodule detection of Reeves to also detect colon polyps as taught by Li.

Allowable Subject Matter

Claims 26, 30, 31 and 46 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Contact Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Wes Tucker whose telephone number is (571)272-7427. The examiner can normally be reached on 9am-5pm Monday through Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Vikkram Bali can be reached on (571)272-7415. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Wes Tucker/
Primary Examiner, Art Unit 2624